MINISTRY OF PUBLIC BUILDING
AND WORKS

United Kingdom Housing Mission to Canada: June, 1963

Report to the Minister of Public Building and Works, the Secretary of State for Scotland and the Minister of Housing and Local Government

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PREFACE

This report describes Canadian timber framed houses, components and building methods which the Mission saw in various parts of Canada. It concludes that the methods used are capable of adaptation to United Kingdom conditions to meet a measure of its housing requirements and recommends steps to be taken to help bring this about.

DONALD GIBSON

CONTENTS

UNITED KINGDOM HOUSING MISSION TO CANADA

June 1st-22nd, 1963

Establishment of the Mission

1. The Mission was formed on the initiative and generous invitation of the Canadian Government acting through His Excellency The Hon. George A. Drew, Q.C., High Commissioner for Canada in Britain.

2. Conscious of the effort to increase efficiency and productivity in house building in Britain, the Canadian Government offered this opportunity for the study of Canadian methods of construction—adapted to extreme climatic conditions—and factory production and on-site organisation in terms of efficiency and productivity. In addition, it offered an opportunity for first hand examination of building methods in all parts of Canada, including industrial centres, small municipalities, and satellite residential areas, as well as a free exchange of ideas on constructional systems and housing layout with housing authorities, architects and builders.

3. All interests concerned welcomed the invitation of the Canadian Government in the knowledge that Canadian experience, practice and research would be of great value in developing joint interests, and in speeding the solution of some of the problems facing the United Kingdom during an expansion of the house building programme, and the need to develop industrialised systems of house building to supplement current output.

Membership

4. The 16-member Mission consisted of representatives from both Central and Local Government in the United Kingdom and from the Royal Institution of Chartered Surveyors, the National Federation of Building Trades Employers, the Federation of Registered House Builders, the Building Societies Association, the Timber Research and Development Association, the Timber Building Manufacturers' Association of Great Britain, and representatives of the Executive of the Timber Trade Federation of the United Kingdom.

Materials and Building Practice in Canada

5. (*a*) In the course of our tour we visited building sites in various parts of Canada and saw many completed houses, and others in various stages of erection. We were impressed by the fact that throughout this vast country with its different climatic regions, the basic type of construction for individual houses and bungalows, semi-detached dwellings and even blocks of 3-storey flats, was substantially the same—namely timber framing with "dry" linings and external sheathing with a variety of external cladding ranging from timber boarding and exterior grade plywoods to veneers of brickwork or masonry.

(*b*) Wall framing members and floor joists were always of dressed timber and the number of different sections used was very limited. This contributed greatly to the ease and speed of framing and assembly, whether jigged

on site or in the shop. We visited a number of plants producing wall frame panels and partitions, as well as windows, composite door and frame units and kitchen fitments and were impressed by the relatively high degree of finish of these components. We noted the simplicity of jointing methods as applied to wall frame panels and the extensive use of highly specialised power tools.

(*c*) In British Columbia and elsewhere, we saw some of the large and efficient mills converting the logs of the indigenous softwoods—particularly Douglas Fir, Hemlock and Western Red Cedar Spruce—into the variety of products used by the Canadian building industry—structural and covering timber graded according to quality and stress-requirements, plywoods of different grades, mouldings, roofing, shingles and shakes. In addition to this visual demonstration of the comprehensiveness of the Canadian timber industry, we were informed of their capacity for expanded export to the United Kingdom particularly of species and grades of material suitable for the house types common in North America. We also saw the production of glue laminated timber components, although these were destined in general for larger structures and were only used to a minor extent in small housing units.

(*d*) The completed houses we saw everywhere presented a high standard of workmanship and finish, despite the evident speed of construction and the relatively low labour content. This we attributed in part to accuracy of fit made possible by the use of precut, and often shop assembled, dressed timber, and in part to the use of simple and ingenious finishing tools and accessories, particularly the method of fixing and finishing the plasterboard linings. These operations were often, but not always, sub-contracted.

(*e*) The predominant form of roofing which we saw in all parts of Canada was asphalt tiles. They are light, cheap and quick to lay as an efficient form of roof covering, with a life expectation of 20-25 years, even under the rigorous climatic conditions of Canada.

Climatic Conditions

6. The climate of Canada varies enormously. There is more rainfall with damper air conditions on the West Coast than in Great Britain. In most of Canada there are very much lower temperatures in winter than in the United Kingdom and in summer the temperature is often very much higher. In spite of these extreme climatic variations a standard type of timber framed construction is in general use for all but high building and commercial building in central areas of cities. It is evident that the construction which we saw was capable of coping adequately with these conditions of cold and damp, and heat and dryness. From the viewpoint of structural stability the Canadian house is capable of supporting repeated heavy snow loads. Some reduction in timber sizes would be possible in meeting the United Kingdom load requirements of roofs.

7. There may be more frequent changes in climatic conditions in the United Kingdom, but in our view this would not invalidate the general conclusions. In Canada the depth of frost penetration in the ground requires very deep foundations and drains, and the deep excavations necessary make the cellar economically worthwhile. Its use is therefore widespread there, but it would not apply in the United Kingdom.

8. In most of Canada the winter is longer, and the conditions for building are worse than in the United Kingdom, but the dry techniques of timber construction lend themselves to factory production, with a very rapid assembly time on the site. This allows for early covered shelter so that subsequent finishing trades can operate in the coldest and wettest weather, building operations being phased accordingly.

General Conclusions

9. On the basis of our own observations, and the information which was readily supplied to us, we reached the following preliminary conclusions about current Canadian timber framed houses:

(*a*) *Strength and Stability*

The simple stud framing, with sheathing joist and floor board construction, permits the erection of strong and sturdy homes despite the extreme simplicity of the nailed connections with little or no bolting, housing, tenoning and other elaborate jointing methods.

(*b*) *Durability*

With well designed and executed details, and with the standard of finish usually provided, there is no reason to doubt the durability of the houses well beyond the usual mortgage term of 25 or 30 years. In point of fact, many thousands of similar finish framed houses built in the United Kingdom benefited from Government loans during the post-war period. We were told that attack on the structures by dry-rot or wood boring insects presents no problem in Canada even in the wetter regions of British Columbia with climatic conditions similar to the United Kingdom. Reasons given include the all dry construction and high standards of heating.

(*c*) *Maintenance*

Except for the periodic treatment of external cladding, which varies with the material used, there is little difference from practice in the United Kingdom. Painted or varnished weather boarding on an extensive scale would materially increase maintenance costs, and for this reason cheap and easily applied preservative stains are frequently used. Brick veneer, or stucco on wire mesh, which are common external finishes, appear to present no problem.

(*d*) *Fire Resistance*

Although the building byelaws in Canada are less restrictive than those in the United Kingdom on the use of timber in house construction, particularly in regard to distances to boundary and separating wall construction in terrace houses, statistical evidence and fire insurance rates indicate little difference, if any, between timber framed houses and those of masonry construction. This appears to contrast strongly with the position in the United Kingdom, where we understand considerably heavier insurance rates are charged on timber framed houses, often by the same insurance companies as those operating in Canada.

(*e*) *Sound Insulation*

The sound insulation required, particularly between dwellings, is somewhat lower in Canada than in the United Kingdom where it can be readily met by the use of dry linings, insulating blankets and masonry walling or, in British Columbia, the use of the staggering of studs in separating walls. The higher standard required in the United Kingdom would necessitate a greater mass of wholly non-combustible material in separating walls, and higher standards of floor construction between dwellings than are commonly used in Canada.

(*f*) *Thermal Insulation*

The high standard of thermal comfort achieved in Canadian homes is attributable in part to the efficiency of the fan circulated warm air heating installations which are commonly used. The main factor, however, is the high degree of insulation (sometimes about three times that of British houses) which is so readily provided by means of cheap insulating boards or glass fibre batts fitted between the studs in the framework. Windows are also fitted with efficient draught excluders and are often double and fitted with inexpensive sashes. Applied to the United Kingdom climatic conditions, similar insulation methods would no doubt contribute to greater comfort conditions and might give greater control over expenditure on heating.

(*g*) *Speed of Erection and Labour Content*

Having witnessed on more than one site and in several workshops the speed of erection of the framework and of the assembly of the components, as well as of the installation of services and the application of finishes, we are convinced that timber panel construction with dry linings provides a rapid method with a relatively low labour content. This is enhanced by the ease with which electrical wiring, plumbing and heating installations can be introduced into the framework. A comparison of Canadian experience with common British practice in traditional brick housing would indicate a reduction of production time and the labour content.

(*h*) *Costs*

A cost comparison is rather difficult because of the many variables—types of houses, wage rates, standards of amenities, etc. However, we think that this form of construction could be competitive with brick built houses under United Kingdom conditions where large programmes can be arranged to include a reasonable measure of repetitive work.

(*i*) *Housing Layout*

Whilst most of the sites we visited were sub-divisions, projected by private builders, and contained generally detached individual homes, we also saw a number of higher density schemes of good layout and advanced planning designed or sponsored by the Central Mortgage and Housing Corporation. These latter developments used substantially the same timber frame building techniques, and this in particular encourages us in the belief that similar methods of construction can be adapted to United Kingdom requirements.

In the wide context of higher density housing, we were particularly interested in studying and impressed with the development at Flemingdon Park, Toronto. Here, and with schemes at the drawing board stage which we saw at the C.M. and H.C. Architect's office, it seemed to us that the designers had made a major contribution to the design of high density residential environment whilst accommodating the automobile conveniently and unobtrusively below the pedestrian ways giving access to individual groups of houses. The increase in the number of automobiles in the United Kingdom in the years ahead makes this scheme of particular interest to us, and so far as we know it is the first scheme of its kind which makes a substantial contribution to this problem that confronts us all. It should be noted that this follows from the need in high density schemes to provide a standard amount of space per dwelling of about 2,500 sq. ft. around buildings free from automobiles.

CONTRAST OF PROBLEMS AND PROGRAMMES IN THE UNITED KINGDOM AND CANADA

10. As compared with Canada, where house building consists mainly of single family homes built at low density on generous site frontages, the land shortage in the United Kingdom necessitates the use of much higher densities generally in both public housing and private enterprise house building for sale. Only a small percentage of the United Kingdom output consists of single family detached houses of the sort common in Canada. In public housing, which in England and Wales constitutes about one-third of the total production (including dwellings of all kinds), the houses are mostly the terrace house type: the private house builders on the other hand build mostly in semi-detached form, although land shortage is necessitating an increasing use of terrace houses in this sector also. Densities for house sub-divisions generally range from 8 to 12 and 16 per acre. Also, as compared with Canada, where the majority of homes are for families, the United Kingdom's programme contains a large number of small dwellings of the bed-sitting room, one bedroom and two bedroom type provided in one, two or multistorey blocks. This sector of output accounts for something approaching 50 per cent. of total production. The remainder of the programme consists of 3 or more bedroom houses, and the houses built are at present divided approximately on the ratio of 2 public to 6 or 7 privately built houses.

11. The land shortage factor means in practice that a high proportion of houses in the Public Sector of the terrace house type are often on frontages of about 20 feet. In the Private Sector the average site frontage for a pair of semi-detached houses is often only 60 to 70 feet.

12. Building byelaws in the United Kingdom related to the narrower site frontage are contributory to the differences in practice between the two countries.

13. In particular there are at present major differences in respect to structural fire precautions in separating walls and in external walls parallel to the site boundary. In addition, there are differences in requirements for roof coverings where combustible material is used in front and back walls. Differences in fire separation standards between buildings is another important factor.

14. Currently the Model Building Byelaws in England and Wales are effective generally (excluding London), but these will be superseded by Central Regulations. Under the Public Health Act, 1961, the Minister set up a Building Regulations Advisory Committee and draft regulations are now under review following the receipt of comments from over 100 bodies including all the main local authority, professional and building industry bodies. It is hoped that the advice of this Committee will be tendered to the Minister by the end of the year and that the building regulations will be effective by about the end of 1964.

15. At present, relaxation of a building byelaw can only be made on the initiative of a local authority and with the consent of the Minister. Under Central Regulations, when they come into force, local authorities will be enabled to relax a large number of building regulations without reference to the Minister, but there will be a right of appeal to the Minister against a local authority's refusal to relax.

16. In specific cases relaxations have been allowed in respect to certain of the byelaws relating to structural fire precautions, allowing the greater use of wood, and these may be reflected in the Central Regulations when completed.

17. In Scotland the situation is somewhat different in that the Draft Building (Scotland) Regulations published in 1961 have been the subject of a Public Inquiry during the Mission's visit to Canada. It is expected that these Regulations, which offer an up-to-date code of flexible building requirements coupled with a relaxation procedure, will become effective early next year.

18. From these considerations we have come to the general conclusion that, despite the differences in housing requirements, programming and building regulations between Canada and the United Kingdom, the methods of timber framed house construction we saw in general use in Canada can be modified to suit the requirements of a part of the British housing programme.

19. Recent development work on houses in the Public Sector both by the Ministry of Housing and Local Government's Development Group, the Scottish Development Department, United Kingdom new towns and by certain of the larger local authorities already show an increasing use of timber framing in exterior wall panels and, in the increasing effort to supplement the output by traditional methods, this trend is likely to gain momentum.

Timber Supply Aspects

20. A substantial programme of timber framed houses in the United Kingdom would result in an increased demand for timber and plywood, much of which could come from Canada. In this context the following observations on Canadian timber species and production are relevant :—

(a) *Availability*

Subject to agreement on species, specification and price, there is no doubt that Canadian producers are well able to supply any foreseeable increase in timber and plywood consumption in the United Kingdom.

(b) *Species*

Douglas Fir: This timber is well known and appreciated but its higher price confines its use to special purposes and it is unlikely to be greatly used in ordinary housing.

Hemlock and Balsam: These are also known and widely used for simple construction work, but for purposes where stress grading is required, it must be so marked. The mixed commercial grade appears to be used in Canadian framed houses and would no doubt find a similar market in the United Kingdom.

Western White Spruce: This wood is comparable to European IVth's and Vth's and its increased consumption in this form or as plywood would depend on its being competitive in grade, price and manufacture.

Western Red Cedar: This wood is widely appreciated especially for its colour and durability. The obief problem appears to be availability in required specifications of tbe higher grades.

Eastern White Spruce: This timber is widely exported to tbe United Kingdom at present and is of a quality readily acceptable there. This export production is in British Standard sizes and the sawing and preparation is comparable to European production. It sometimes includes dressing to British sizes.

(c) *Specification*

Consumers in the United Kingdom are accustomed to order and receive wood in sawn sizes covered by B.S.I. Standards and this is normally a full-size section subject to a maximum tolerance of $\frac{1}{8}$". About three-quarters of the Britisb softwood import comes from European sources and meets these requirements.

Canadian suppliers to the United Kingdom of sawn timber also conform, but these exports are limited to what are currently produced in Canada to this specification and are competitive.

Timber frame construction requires accurate sizes. This would appear to be most readily obtained by using dressed wood.

Timber dressed to C.L.S. (Canadian Lumber Standards) sizes, does not however conform to Britisb Standards Institution specifications and structural tables in byelaws and building regulations. This precludes interchangeability with European timbers. The need for double stocking by importers and timber merchants also tends to inhibit tbe increased use of C.L.S. dressed lumber.

(d) *Packaging*

We are convinced that the packaging of timber must steadily increase. Further study of current problems in this field is required, and in particular the prevention of damage to the better grades of plywood is most desirable.

RECOMMENDATIONS

21. Tbe United Kingdom is now facing a future in which the building load will increase considerably. The labour force available is unlikely to

grow in proportion. This will call for quicker and more efficient ways of building. The adoption of the building techniques which we have seen in Canada could make a contribution, particularly in the field of housing.

22. Many millions of homes of this type have been built in Canada and the U.S.A. Many have existed for several generations of use. They are built to government codes of practice and are financed both privately and by government funds. The fire insurance presents no difficulty and is often underwritten by United Kingdom finance. Nevertheless, these are problems to be solved in adopting the techniques in the United Kingdom, because our national experience and building codes and attitudes to insurance and finance have been based upon a tradition of wet and heavy construction using brick and concrete and plaster.

23. In order to isolate and solve these problems, and to make quick progress, we make the following recommendations:—

(*a*) *Canadian Demonstration Houses*

Three pairs of two storey houses suitably sited should be built in the United Kingdom in order to demonstrate the building techniques used in Canada, and to show the speed of erection and the use of new tools and equipment. They would also show the standard of finishes obtainable. One pair should be in Scotland, one pair in the Midlands, and one pair in the south of the country. (This pair could usefully be sited at the Building Research Station.) Each pair would remain untenanted. One house in each pair would be finished and the other remain unfinished to demonstrate the structural details as a vehicle for education and instruction over a period of several months. The houses should be typically Canadian in every respect except for the provision of basements. This project should be under the direction of the Canadian Government (Central Mortgage and Housing Corporation) and the houses should be built and supervised by Canadian personnel using British Standard sizes of timber.

(*b*) *A Medium Density Project*

The erection of the three pairs of houses referred to above must be regarded as a way of showing these new techniques to the potential users, both government and local authorities, and also private purchasers and builders. They will not demonstrate the architectural and town-planning possibilities which a large group of these houses is capable of providing. Neither will they prove in terms of cost and value for money that these houses are viable in Britain.

For this reason there should he a group of about 200 dwellings erected in the United Kingdom. This should be arranged between the two Governments. The site could be a Services housing scheme under the auspices of the Minister of Public Building and Works, or a local authority or new town scheme under the auspices of the Minister of Housing and Local Government, or the Scottish Development Department. In either case it should be understood that the code of practice should be that which now operates in Canada. Any need to vary the British Building Regulations should be studied during this period, but should not delay the building of this project. The planning, design,

and supervision and contract organisation should be the responsibility of the Canadian Government (Central Mortgage and Housing Corporation). The internal planning of the houses should be done in consultation with the Ministry of Housing and Local Government in the United Kingdom or with the client authority. Timber should be dressed to British Standard sizes. The best results at this stage could be achieved by an association between a Canadian and a British contractor, so that where appropriate the equipment and components readily available could be employed. It would also help to familiarise the British contracting industry and the trades unions with this form of building.

(*c*) *Project Visit By United Kingdom House Builders*

In our view there would appear to be scope in the private sector in Britain for the single family type of houses which we saw in Canada. To encourage the " know how " we recommend that a group of Registered House Builders from the United Kingdom be invited to see houses in Canada. It would also be very desirable to ensure that the appropriate building trades unions and building societies are kept in the picture so that their co-operation could be ensured. A small group which could visit sites at the same time as the builders would probably be most successful.

(*d*) *Exhibitions*

The Bi-Annual Building Trades Exhibition will take place at Olympia this year in November. The theme is industrialised building. It would be appropriate if the Canadian Government could arrange that the subject of timber framed construction is well displayed, possibly with the aid of films. Also equipment such as hot air heating and windows and winter building plant should be on show. The Ministry of Public Building and Works is to hold a regional exhibition in Leeds about September-October this year. The theme will also be industrialised building. In this case the same remarks apply.

ACKNOWLEDGEMENTS

24. We are deeply indebted to the Canadian Government for arranging this Mission, and to all our many kind hosts across the country who have showered generous hospitality upon us, and given up so much of their time in allowing us to benefit from their invaluable knowledge and experience. We are also indebted to all the officers of the Department of Trade and Commerce, C. Rooke (Office of the High Commissioner for Canada, London, England) and Robert C. Bennet, Peter G. Willson and Robert F. Degrace (Canadian Industry Observers) who have helped us in every way and made it possible for us to cover so much ground in so short a time.

25. We wish especially to thank our Secretary, Jack White, for the spendid way in which he has arranged all our activities whilst attending to all our needs and looking after our comforts as well.

APPENDIX

LIST OF MEMBERS OF THE MISSION

Sir Donald Gibson—Director General of Research and Development, Ministry of Public Building and Works.

Mr. Bruce Kennedy—President, Timber Trades Federation of the United Kingdom.

Mr. Alec Bellamy—Principal Architect, Ministry of Housing and Local Government.

Mr. J. Austin Bent—Director, Housing Department, City of Manchester.

Mr. J. A. Burrell—Chairman, Chartered Quantity Surveyors Standing Committee, Royal Institute of Chartered Surveyors.

Mr. Bernard E. Crysell—Timber Building Manufacturers Association of Great Britain.

Mr. James M. Davies—National Softwood Importers Section, Timber Trades Federation of the United Kingdom.

Mr. Charles Garratt-Holden—Vice-President, Building Societies' Association, and Secretary General, International Union of Building Societies.

Mr. David C. H. Jenkin—City Architect, Hull, Yorkshire, Housing Consortium.

Mr. Ezra Levin—Chief Architect and Deputy Director, Timber Research and Development Association.

Mr. Norman Longley—National Federation of Building Trades' Employers.

Mr. J. B. Lumby—Chairman, Timber Trades Federation of the United Kingdom.

Mr. Alan Monk—Plywood Section, Timber Trades Federation of the United Kingdom.

Mr. F. G. Reeves—National Softwood Importers Section, Timber Trades Federation of the United Kingdom.

Mr. Bernard F. Stanbury—President, Federation of Registered House Builders.

Mr. Robert Woodcock—Deputy Chief Architect, Scottish Development Department.

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